

III. REMARKS

As set forth in the Office Action, the examiner rejected claims 1-2 and 8-14 under 35 U.S.C. 103(a) as being unpatentable over Kleijn et al. (US 6,223,151) in view of Griffin (IEEE Transactions on Acoustics, Speech, and Signal Processing, Vol. 36, No. 8, August 1988, pages 1223-1235; Griffin, Lim: Multiband Excitation Vocoder). Furthermore, claims 3-5, 7 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kleijn et al. in view of Griffin, and further in view of Kleijn (US 5,517,595). Furthermore, claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kleijn et al. in view of Donovan et al. (US 6,266,637). The Office Action is thus identical to the previous Office Action (dated April 20, 2004) with the only difference being the addition of Griffin concerning claims 1, 8, 12 and 15.

The following analysis and argument are presented to overcome the foregoing rejections, and to show the presence of patentable subject matter in the present claims.

Griffin discloses a method for calculating a normalized autocorrelation for each harmonic frequency in order to make the voiced/unvoiced decision for each harmonic. The method is based on greater periodicity of a voiced audio signal waveform in the frequency domain compared to an unvoiced audio signal. In other words, in Griffin (referenced by the Office Action at page 3, lines 11-12), a voiced/unvoiced decision is made by comparing the normalized error of each harmonic to a set threshold. If the threshold is exceeded, noise energy is included in that frequency band and thus the harmonic component (or the specific

frequency band) is decided to be unvoiced. Griffin (Office Action at page 3, lines 12-14) further discloses that the coding method of the audio signal phase is dependent on the harmonic's voiced or unvoiced nature (the phase is not coded when the harmonic is unvoiced).

It is emphasized that, in the teaching of Griffin which is relied upon by the examiner in the rejection of the claims, the coding method of the audio signal amplitude is not affected by the voicing parameter. On the contrary, the voicing parameter affects the number of bits used for expressing the signal amplitude and phase before coding. This teaching of Griffin contradicts the amendatory passages added in the previous response. Therefore, the claims as amended in the previous response are believed to be allowable without further amendment. Accordingly, the claims have not been amended further in this response.

Kleijn et al. discloses a method for preprocessing the speech signals before speech encoding. The purpose is to divide the signal into blocks in which the signal has a relatively low power at the beginning and at the end of a block. A residual signal is created by linear prediction, and is fed to the encoder. One rule, in creation of the blocks, is placing the pitch pulse near the block center. In the method, the peaks of the fundamental frequency of the voice signal in the time domain are examined and the pitch period is estimated. A first set of refined cycles are determined for the signal by maximizing the cross correlation of the two adjacent cycles in the time domain. After that a second set of refined cycles is created where the peak is transferred to the center of the cycle. The first and second sets of refined cycles are concatenated and transferred

into a linear prediction filter. The filtered signal and the borders of the cycles are fed to the encoder.

Kleijn discloses a coding method for a speech signal. A set of parameters describing the signal waveform in a certain time instant is created. The set of parameters defines the first group of signals which are filtered with a high-pass filter. Thus a second group of signals is achieved where relatively rapidly changing components of the waveform can be monitored as a function of time. The encoding of the speech signal is done based on the second group of signals.

Donovan et al. relates to speech synthesizing. In Donovan the speech signal (namely, sentences) are processed in sliced parts (such as words and phonemes). Previously recorded words and phrases are combined with the words and phrases created by synthesis. The relevant point of Donovan et al. is the use of TD-PSOLA (Time Domain Pitch Synchronous Overlap-Add) as a signal processing algorithm. The algorithm is used for changing the pitch values and signal duration of the speech signal.

The present invention discloses a method for speech signal processing and encoding where the voicing analysis accuracy is improved prior to speech encoding. A high jitter level causes problems in speech encoding. In the present invention the effect of jitter is reduced by changing (normalizing) the pitch cycles in the time domain. The pitch scaling in the time domain is performed with the TD-PSOLA algorithm in one embodiment of the invention. The analysis can be done to the residual signal (the original speech signal subtracted by a linearly predicted signal) or directly to the speech signal. The modified speech signal is used for classifying the signal to a predefined voiced

or unvoiced class (the same as calculating the voicing parameter). The encoding method is chosen based on the class and the signal is encoded according to the chosen method. Thus, the phonemes of the speech signal can be analyzed more effectively because the periodicity of the original speech signal improves.

The present invention includes the aforementioned modification of a signal to a more periodical one, the decision making of the voicing parameter and the choosing of the encoding method according to the voicing parameter. Thus, the present invention has an inventive step in view of the prior art. Additionally, Griffin states that only the encoding of the phase, whether the phase is encoded or not, is dependent on speech being classified as voiced or unvoiced, correspondingly. That differs significantly from the concept of the present invention.

The foregoing divergent teachings of the cited art would not motivate one to combine these teachings and would direct one away from an attempted combination of the teachings of the cited art as has been done in the aforementioned rejections of the claims under 35 U.S.C. 103.


In view of the above, the applicant respectfully submits that the independent claims 1, 12 and 15 are not obvious from the cited references and therefore, they and their respective dependent claims define patentable subject matter.

For all of the foregoing reasons, it is respectfully submitted that all of the claims now present in the application are clearly novel and patentable over the prior art of record, and are in proper form for allowance. Accordingly, favorable

reconsideration and allowance is respectfully requested. Should any unresolved issues remain, the Examiner is invited to call Applicants' attorney at the telephone number indicated below.

The Commissioner is hereby authorized to charge payment for any fees associated with this communication or credit any over payment to Deposit Account No. 16-1350.

Respectfully submitted,


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